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GEOLOGICAL SURVEY

Helium concentrations in soil-gas over known petroleum accumulations, WaKeeney area, Trego County, Kansas

by

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ABSTRACT

A helium in soil-gas survey was conducted over a 31.2 km^2 (12 mi^2) area northeast of the town of WaKeeney, Trego Co., Kansas. In order to test the rusefulness of helium measurements as an exploration tool for petroleum, over 1000 samples were obtained on 0.26 km (0.1 mi) centers over 6 oil fields. Permanent sampling probes were situated in strategic areas to correct the raw data for variations probably due to differences in soil moisture, ground heating, soil type, and soil permeability. The resultant corrected data marginally correlate with oil field positions.

INTRODUCTION

The purpose of this report is to release data obtained from a June 1982 helium soil-gas survey carried out on the southwest flank of the Central Kansas Uplift in Trego Co., Kansas. All of the data obtained in this survey is presented (table 1) but interpretation is minimal.

Researchers investigating variations in the helium content of soil-gas have reported anomalous concentrations overlying petroleum accumulations (Debnam, 1969; Ball and Snowdon, 1973; Dyck, 1976; Roberts, 1981; Philp and Crisp, 1982; Jones and Drozd, 1983; Roberts and Cunningham, 1985; Cunningham and others, 1987). As part of an effort by the USGS to quantify the relationship of helium concentrations in soil-gas over producing and historically producing fields, a survey was conducted in the summer of 1982 over a 12 section area in Trego Co. where 6 small oil fields occur: (1) WaKeeney East, (2) Mong, (3) Hixon, (4) Hixon East, (5) Hixon Northeast, and (6) Shaw Creek (Paul and Beene, 1983).

EXPERIMENTAL

Over one thousand samples were collected on 0.16 km (0.1 mi) centers in a 12 section area of the USGS WaKeeney East 7.5′ quadrangle (fig. 1). In areas where road-access was not possible samples were obtained by walking traverses (approximately 83% of the samples were acquired in this manner). A single crew member could obtain 3 to 4 1.6 km (1.0 mi) traverses in a day with 10 to 11 discrete samples per traverse. In order to correct this raw data for observed diurnal (temporal) variations, permanent sampling probes were located in strategic areas within the survey area. These probes were sampled every two to three hours in order to establish a baseline against which all other samples could be compared and corrected as required. Survey samples were collected by driving a hollow probe into the ground to a depth of 0.75 m (2.5 ft) and attaching an air-tight septum to the top (Reimer and Bowles, 1979). The first 10 cm^3 of soil-gas is withdrawn into a standard B-D syringe fitted with a sidehole needle and discarded to purge the dead-air volume of the probe. After approximately five seconds, a second 10 cm^3 sample is withdrawn and used for the actual analysis. The syringe is sealed and the sample

analyzed by a mobile mass spectrometer within 4-6 hours. Sample collection procedures from the fixed permanent probes are identical.

ANALYTICAL

All analyses for helium were performed in the field using a mobile mass spectrometer developed by the USGS (**Reimer, 1976; Friedman and Denton, 1976; Reimer and Denton, 1978**). The system consists of a truck-mounted mass spectrometer leak detector capable of analyzing one sample every 2-3 minutes with a sensitivity and precision of 10 ppb by volume. The unit is equipped with a unique constant-pressure inlet system capable of accepting samples from syringes with sidehole needles. The unit operates in a fully self-contained mode via a propane-powered generator supplying current to 110 and 220V voltage conditioners. During analysis two reference standards are run approximately every 10 minutes to calibrate the mass spectrometer. All helium concentrations in this report are expressed as parts per billion (ppb) above or below the ambient air background of 5240 ppb helium originally reported by **Glueckauf (1946)**.

DISCUSSION

Raw data correction for diurnal (temporal) variation was accomplished following documented methods using standard regression techniques (**Reimer and Roberts, 1985**). The contour map of all (full range) uncorrected helium values (**fig. 3**) displays distinct east to west patterning and many areas of extremely low helium values on the order of -40 to -180 ppb by volume below atmospheric concentrations. The map clearly demonstrates the hazard of combining multiple-traverse data sampled at different times of the day. In an attempt to correct this effect, local permanent probe data were regressed to calculate a time-based function against which individual samples collected in that area could be compared. Table 1 lists the sample number, longitude, latitude, uncorrected helium (ppb by volume), and corrected helium (ppb by volume). The map of corrected helium values contoured above atmospheric concentrations of 5240 ppb (**fig. 4**) shows considerably less aliasing and additionally corrects areas of steep gradients which occurred in the uncorrected dataset. Comparison of this corrected data with the position of known oil fields does not produce a significant correlation except in the Shaw Creek and Mong field areas. Other anomalies in the survey area below the atmospheric background of 5240 ppb by volume may be the result of helium dilution by other soil-gas components such as methane and carbon dioxide or the failure of the correction algorithm to account for other significant, but as yet unidentified, variables.

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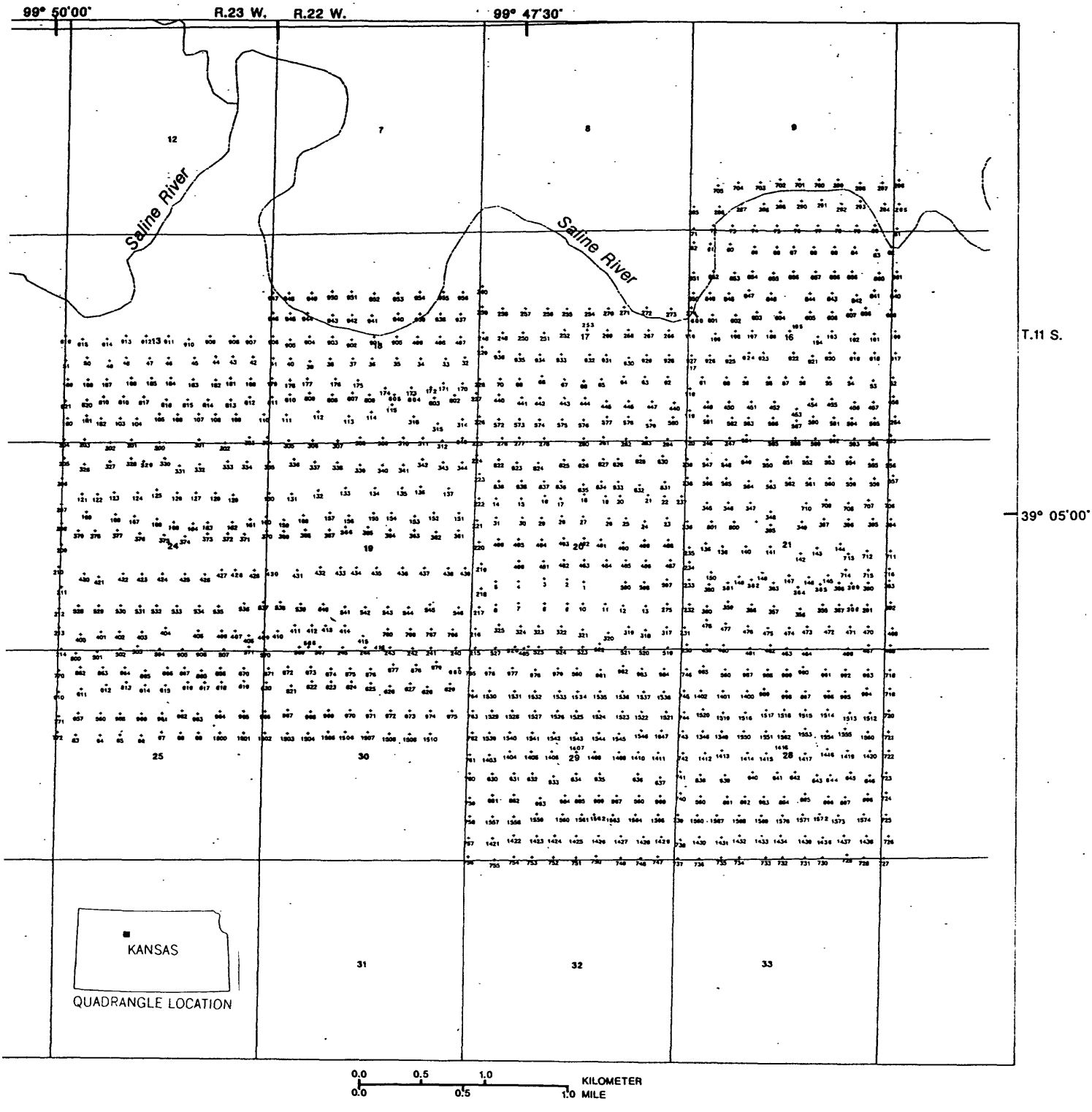

Figure 1. Index map of helium survey sample locations and sample number, Trego Co., Kansas.

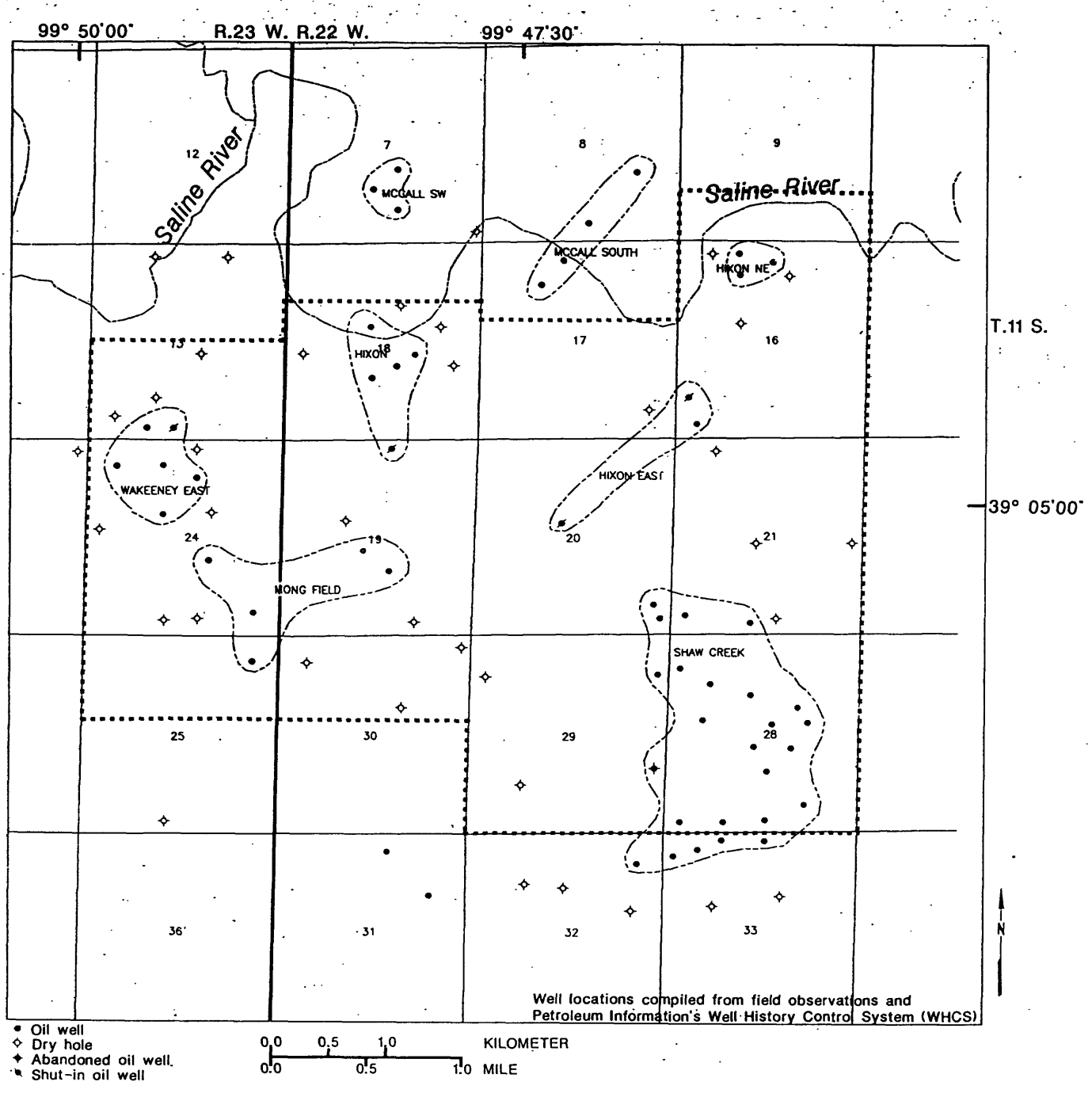

Figure 2. Distribution of oil fields and dry holes occuring in the helium survey area as of June 1982, Trego Co., Kansas. Dashed lines denote oil field production limits. Heavy dashed line encloses survey area.

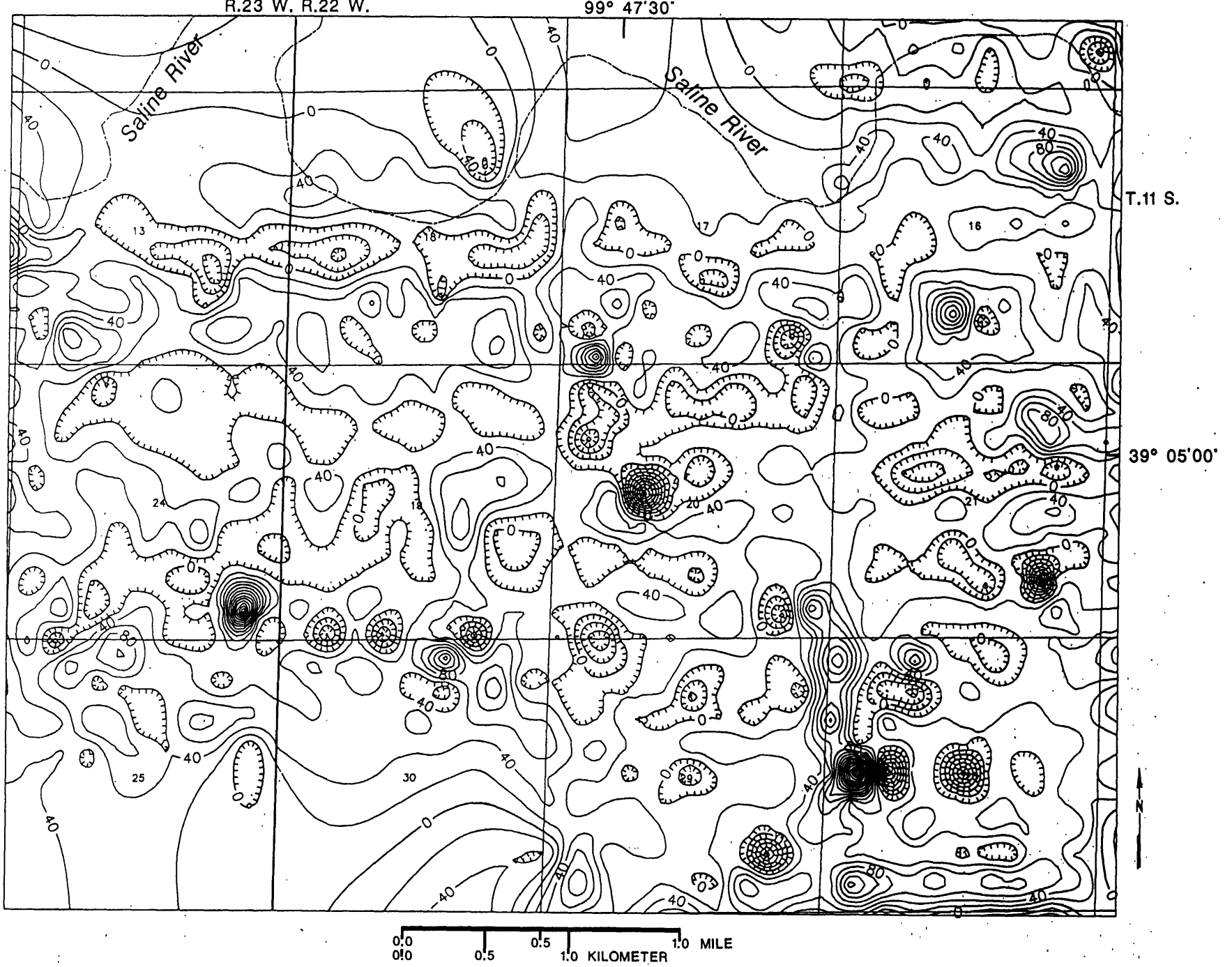

Figure 3. Contour map of temporally uncorrected helium concentrations in soil-gas relative to ambient atmospheric helium concentration (5240 ppb), Trego Co., Kansas. Contour interval 20 ppb by volume.

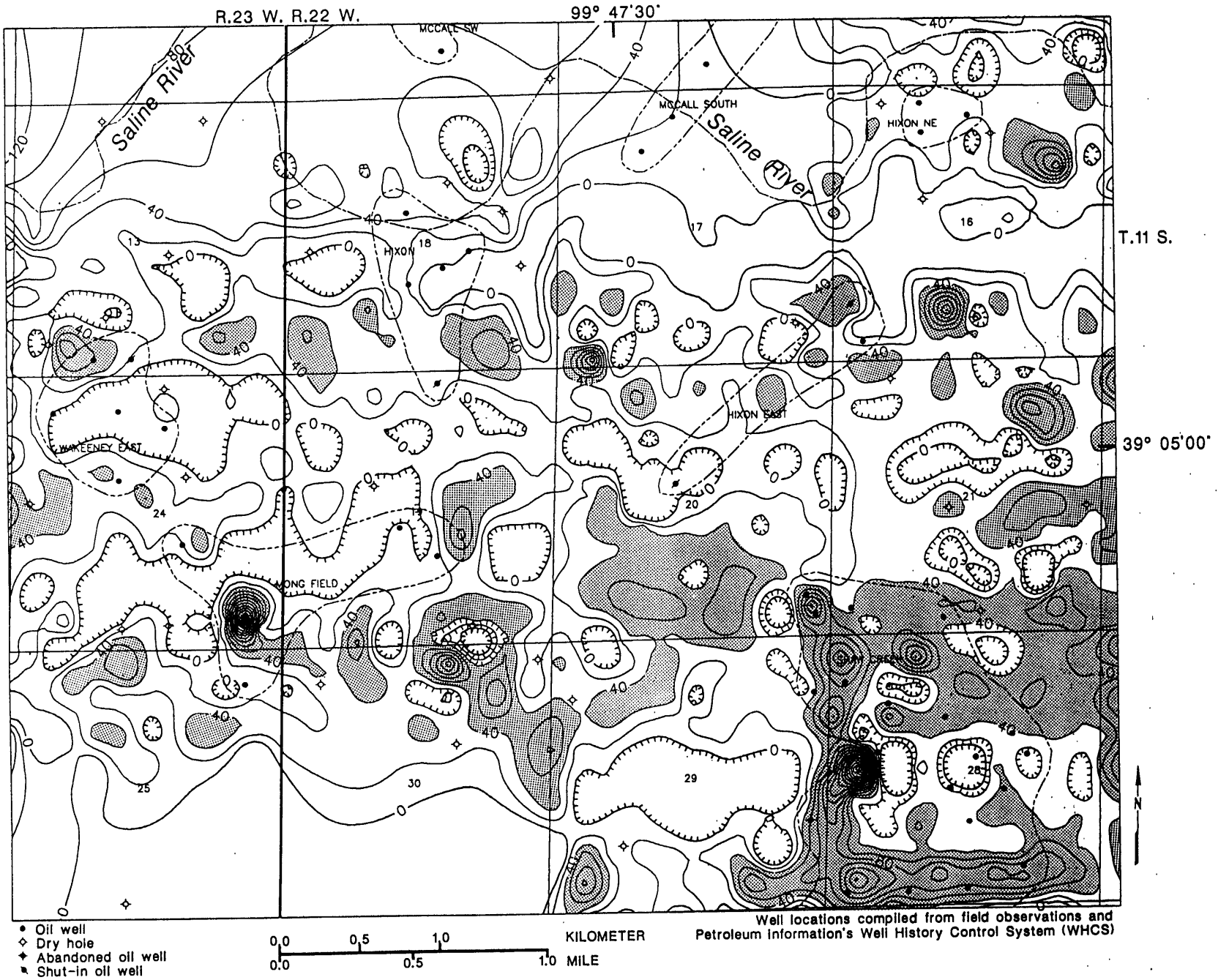

Figure 4. Map of temporally corrected helium concentrations in soil-gas contoured above the ambient atmospheric helium concentration (5240 ppb), Trego Co., Kansas. Contour interval 20 ppb by volume. Dashed line delineates oil field production limits. Screened areas denote significant helium anomalies.

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
1	99.4720	39.0470	21	44
2	99.4729	39.0471	35	60
3	99.4741	39.0471	21	47
4	99.4755	39.0470	7	34
5	99.4767	39.0470	0	28
6	99.4767	39.0460	14	43
7	99.4755	39.0461	28	58
8	99.4741	39.0461	21	52
9	99.4729	39.0461	7	40
10	99.4721	39.0461	-7	27
11	99.4709	39.0461	35	70
12	99.4699	39.0460	28	64
13	99.4687	39.0460	7	44
14	99.4767	39.0504	-70	-96
15	99.4754	39.0504	13	-12
16	99.4741	39.0505	6	-17
17	99.4733	39.0504	26	4
18	99.4720	39.0506	49	28
19	99.4709	39.0505	35	15
20	99.4701	39.0505	39	20
21	99.4686	39.0506	26	8
22	99.4677	39.0505	26	9
23	99.4676	39.0496	21	5
24	99.4688	39.0495	0	-15
25	99.4698	39.0496	21	7
26	99.4707	39.0496	21	9
27	99.4721	39.0497	-21	-32
28	99.4732	39.0497	21	11
29	99.4743	39.0496	6	-3
30	99.4753	39.0496	0	-8
31	99.4767	39.0496	21	14
32	99.4784	39.0563	-24	-8
33	99.4794	39.0562	-36	-19
34	99.4807	39.0562	-36	-18
35	99.4820	39.0562	-12	7
36	99.4833	39.0562	0	20
37	99.4843	39.0562	0	21
38	99.4855	39.0562	-24	-2
39	99.4866	39.0561	-48	-26
40	99.4876	39.0562	-24	-1
41	99.4885	39.0562	-24	0
42	99.4896	39.0563	-18	7
43	99.4907	39.0563	-12	14
44	99.4916	39.0563	-36	-9
45	99.4927	39.0562	-36	-8
46	99.4941	39.0562	-30	-1
47	99.4951	39.0562	0	30
48	99.4964	39.0562	12	43
49	99.4973	39.0561	6	38
50	99.4985	39.0562	-38	-5
51	99.4996	39.0561	-62	-29
52	99.4554	39.0555	7	-21
53	99.4565	39.0554	42	15

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
54	99.4577	39.0555	-7	-33
55	99.4589	39.0555	28	3
56	99.4603	39.0555	28	4
57	99.4612	39.0555	28	5
58	99.4621	39.0555	28	6
59	99.4634	39.0555	35	14
60	99.4644	39.0555	-21	-41
61	99.4657	39.0555	56	37
62	99.4676	39.0555	28	10
63	99.4688	39.0555	35	18
64	99.4699	39.0555	35	19
65	99.4711	39.0554	-28	-43
66	99.4721	39.0553	-21	-35
67	99.4731	39.0554	14	1
68	99.4743	39.0555	56	44
69	99.4755	39.0554	42	30
70	99.4765	39.0554	42	31
71	99.4662	39.0617	-60	-41
72	99.4651	39.0618	-36	-16
73	99.4641	39.0618	0	21
74	99.4629	39.0618	-24	-2
75	99.4617	39.0618	0	23
76	99.4606	39.0618	-31	-7
77	99.4595	39.0618	0	25
78	99.4584	39.0618	6	32
79	99.4574	39.0618	0	27
80	99.4564	39.0618	25	53
81	99.4552	39.0617	0	29
82	99.4555	39.0609	0	30
83	99.4563	39.0608	13	44
84	99.4575	39.0609	-6	26
85	99.4586	39.0609	0	33
86	99.4597	39.0609	0	35
87	99.4608	39.0609	-6	30
88	99.4617	39.0609	6	43
89	99.4629	39.0609	-6	32
90	99.4642	39.0610	0	39
91	99.4653	39.0610	-13	27
92	99.4662	39.0611	0	41
93	99.4990	39.0405	36	4
94	99.4977	39.0405	42	11
95	99.4966	39.0405	12	-18
96	99.4955	39.0405	60	31
97	99.4944	39.0406	60	31
98	99.4934	39.0406	38	10
99	99.4924	39.0406	50	23
100	99.4995	39.0537	51	26
101	99.4985	39.0538	0	-24
102	99.4977	39.0537	118	96
103	99.4967	39.0537	76	55
104	99.4958	39.0537	68	48
105	99.4946	39.0539	42	24
106	99.4936	39.0539	34	17

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
107	99.4925	39.0539	51	36
108	99.4916	39.0539	84	70
109	99.4905	39.0539	68	55
110	99.4890	39.0539	34	23
111	99.4878	39.0539	76	66
112	99.4861	39.0540	25	17
113	99.4845	39.0538	51	44
114	99.4833	39.0540	34	28
115	99.4822	39.0543	42	38
116	99.4664	39.0574	40	56
117	99.4663	39.0561	8	25
118	99.4664	39.0550	32	49
119	99.4664	39.0541	32	50
120	99.4664	39.0530	16	35
121	99.4987	39.0505	56	29
122	99.4979	39.0505	8	-18
123	99.4970	39.0506	24	0
124	99.4957	39.0506	32	9
125	99.4947	39.0507	0	-21
126	99.4936	39.0506	0	-20
127	99.4926	39.0506	8	-10
128	99.4916	39.0506	0	-17
129	99.4906	39.0505	32	16
130	99.4887	39.0506	24	10
131	99.4875	39.0506	0	-13
132	99.4861	39.0507	16	5
133	99.4847	39.0508	8	-2
134	99.4831	39.0508	0	-8
135	99.4817	39.0508	32	25
136	99.4807	39.0509	0	-6
137	99.4792	39.0508	0	-4
138	99.4655	39.0486	23	37
139	99.4646	39.0485	16	32
140	99.4633	39.0485	0	17
141	99.4620	39.0485	39	57
142	99.4604	39.0482	8	28
143	99.4595	39.0484	31	52
144	99.4582	39.0486	47	69
145	99.4589	39.0473	31	55
146	99.4599	39.0472	31	56
147	99.4610	39.0473	8	35
148	99.4624	39.0474	0	28
149	99.4637	39.0472	0	29
150	99.4652	39.0474	0	31
151	99.4787	39.0498	36	7
152	99.4800	39.0498	65	38
153	99.4810	39.0497	51	25
154	99.4822	39.0498	36	12
155	99.4832	39.0498	29	6
156	99.4845	39.0497	36	14
157	99.4855	39.0498	44	24
158	99.4869	39.0497	14	-5
159	99.4879	39.0495	22	5

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
160	99.4889	39.0496	58	42
161	99.4897	39.0495	22	8
162	99.4907	39.0494	22	9
163	99.4920	39.0494	7	-4
164	99.4928	39.0493	29	19
165	99.4938	39.0494	36	28
166	99.4947	39.0495	44	37
167	99.4959	39.0496	51	46
168	99.4969	39.0497	44	40
169	99.4985	39.0498	44	42
170	99.4785	39.0552	28	1
171	99.4795	39.0552	18	-8
172	99.4802	39.0550	28	3
173	99.4812	39.0550	37	14
174	99.4826	39.0550	-56	-78
175	99.4840	39.0553	46	25
176	99.4852	39.0554	37	17
177	99.4867	39.0554	0	-18
178	99.4876	39.0553	16	-1
179	99.4886	39.0554	23	7
180	99.4897	39.0554	31	16
181	99.4908	39.0554	39	26
182	99.4916	39.0553	-54	-66
183	99.4928	39.0553	16	5
184	99.4940	39.0554	24	15
185	99.4950	39.0554	48	40
186	99.4961	39.0554	32	25
187	99.4974	39.0553	24	18
188	99.4984	39.0553	48	44
189	99.4995	39.0553	64	61
190	99.4553	39.0574	6	-21
191	99.4564	39.0573	26	0
192	99.4575	39.0573	46	21
193	99.4587	39.0574	26	2
194	99.4595	39.0572	52	30
195	99.4610	39.0574	39	18
196	99.4620	39.0574	26	6
197	99.4630	39.0574	0	-19
198	99.4639	39.0574	0	-18
199	99.4650	39.0573	20	3
200	99.4946	39.0527	16	-8
201	99.4961	39.0528	64	40
202	99.4972	39.0527	72	49
203	99.4986	39.0528	40	18
204	99.4997	39.0528	40	19
205	99.4997	39.0520	64	43
206	99.4998	39.0512	56	36
207	99.4998	39.0501	16	-3
208	99.4998	39.0493	64	46
209	99.4998	39.0484	87	70
210	99.5000	39.0475	58	41
211	99.4998	39.0467	51	35
212	99.4999	39.0458	36	21

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
213	99.4999	39.0450	29	15
214	99.4998	39.0441	22	8
215	99.4778	39.0442	44	31
216	99.4778	39.0450	14	2
217	99.4776	39.0459	44	33
218	99.4775	39.0467	29	18
219	99.4775	39.0477	36	26
220	99.4776	39.0486	22	13
221	99.4777	39.0495	37	29
222	99.4776	39.0504	14	6
223	99.4776	39.0514	37	30
224	99.4777	39.0522	37	31
225	99.4777	39.0529	29	24
226	99.4776	39.0538	51	46
227	99.4778	39.0548	58	54
228	99.4776	39.0554	58	55
229	99.4775	39.0567	36	34
230	99.4665	39.0444	91	67
231	99.4666	39.0451	58	35
232	99.4664	39.0461	33	11
233	99.4664	39.0471	33	11
234	99.4664	39.0478	33	12
235	99.4664	39.0484	8	-12
236	99.4665	39.0495	0	-19
237	99.4668	39.0505	33	15
238	99.4665	39.0513	50	33
239	99.4665	39.0521	25	9
240	99.4788	39.0442	16	1
241	99.4801	39.0442	41	27
242	99.4811	39.0442	-54	-67
243	99.4823	39.0442	27	15
244	99.4836	39.0442	54	43
245	99.4848	39.0442	-45	-56
246	99.4654	39.0530	0	50
247	99.4642	39.0530	8	60
248	99.4774	39.0573	28	1
249	99.4764	39.0573	28	2
250	99.4753	39.0573	-28	-53
251	99.4742	39.0573	14	-10
252	99.4731	39.0574	7	-15
253	99.4719	39.0574	28	7
254	99.4718	39.0583	28	8
255	99.4730	39.0583	21	2
256	99.4740	39.0583	14	-4
257	99.4752	39.0583	14	-3
258	99.4764	39.0583	14	-2
259	99.4775	39.0584	14	0
260	99.4775	39.0592	35	22
264	99.4553	39.0539	42	35
265	99.4555	39.0531	42	37
266	99.4675	39.0574	13	-9
267	99.4686	39.0574	0	-20
268	99.4697	39.0574	26	7

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
269	99.4708	39.0574	13	-5
270	99.4791	39.0581	39	22
271	99.4699	39.0584	21	6
272	99.4687	39.0584	39	25
273	99.4674	39.0583	26	13
274	99.4663	39.0584	77	65
275	99.4676	39.0461	13	2
276	99.4764	39.0529	200	176
277	99.4755	39.0529	0	-23
278	99.4742	39.0529	50	27
280	99.4721	39.0529	42	20
281	99.4710	39.0530	56	35
282	99.4698	39.0529	28	8
283	99.4687	39.0530	0	-19
284	99.4676	39.0529	84	65
285	99.4662	39.0626	0	21
286	99.4648	39.0626	-12	10
287	99.4636	39.0627	24	47
288	99.4624	39.0627	12	36
289	99.4615	39.0628	24	49
290	99.4604	39.0628	-24	2
291	99.4593	39.0629	18	45
292	99.4582	39.0627	24	52
293	99.4572	39.0628	0	28
294	99.4559	39.0627	-72	-43
295	99.4551	39.0627	30	60
296	99.4551	39.0637	36	67
297	99.4560	39.0636	24	56
298	99.4572	39.0636	18	51
299	99.4584	39.0637	24	58
301	99.4925	39.0528	0	-22
302	99.4911	39.0527	23	3
303	99.4898	39.0529	23	4
304	99.4888	39.0529	45	27
305	99.4877	39.0528	60	44
306	99.4864	39.0528	53	38
307	99.4851	39.0528	38	24
308	99.4839	39.0529	45	32
309	99.4827	39.0529	45	34
310	99.4816	39.0529	45	35
311	99.4806	39.0529	75	66
312	99.4796	39.0528	60	53
313	99.4785	39.0529	30	24
314	99.4785	39.0537	-15	-20
315	99.4798	39.0535	75	71
316	99.4811	39.0538	60	58
317	99.4676	39.0451	135	151
318	99.4687	39.0450	-75	-58
319	99.4696	39.0451	0	18
320	99.4707	39.0449	56	74
321	99.4721	39.0450	38	57
322	99.4732	39.0451	56	76
323	99.4744	39.0451	47	68

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
324	99.4754	39.0451	38	60
325	99.4765	39.0452	19	41
326	99.4986	39.0518	36	8
327	99.4972	39.0519	29	2
328	99.4961	39.0520	-29	-55
329	99.4954	39.0519	15	-9
330	99.4943	39.0520	15	-8
331	99.4935	39.0517	40	18
332	99.4924	39.0518	0	-21
333	99.4909	39.0519	24	4
334	99.4899	39.0519	0	-19
335	99.4887	39.0519	16	-1
336	99.4874	39.0520	56	40
337	99.4863	39.0519	32	17
338	99.4851	39.0519	64	50
339	99.4839	39.0518	24	11
340	99.4827	39.0518	40	28
341	99.4816	39.0518	8	-2
342	99.4806	39.0520	16	7
343	99.4795	39.0519	32	24
344	99.4785	39.0519	32	25
345	99.4654	39.0503	27	41
346	99.4643	39.0503	19	34
347	99.4631	39.0503	0	16
348	99.4620	39.0499	-24	-7
349	99.4603	39.0495	-24	-6
355	99.4592	39.0461	24	50
356	99.4604	39.0459	-47	-20
357	99.4618	39.0460	0	28
358	99.4630	39.0461	0	29
359	99.4643	39.0462	0	31
360	99.4654	39.0460	0	32
361	99.4787	39.0491	54	25
362	99.4799	39.0490	81	54
363	99.4810	39.0491	74	48
364	99.4823	39.0491	68	43
365	99.4835	39.0492	14	-9
366	99.4847	39.0492	0	-22
367	99.4855	39.0491	0	-20
368	99.4868	39.0491	54	35
369	99.4879	39.0490	47	30
370	99.4888	39.0490	0	-16
371	99.4900	39.0489	54	40
372	99.4909	39.0489	40	27
373	99.4920	39.0489	27	16
374	99.4932	39.0488	27	17
375	99.4959	39.0487	54	45
376	99.4956	39.0489	34	27
377	99.4968	39.0490	27	21
378	99.4980	39.0490	61	57
379	99.4989	39.0490	27	24
380	99.4653	39.0469	6	28
381	99.4643	39.0470	0	22

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
382	99.4630	39.0471	6	29
383	99.4618	39.0470	-52	-28
384	99.4605	39.0468	6	31
385	99.4593	39.0469	0	26
386	99.4583	39.0470	0	27
387	99.4583	39.0461	-169	-141
388	99.4576	39.0461	13	41
389	99.4576	39.0470	-6	23
390	99.4567	39.0470	-26	4
391	99.4568	39.0461	14	45
392	99.4555	39.0462	0	32
393	99.4556	39.0471	40	73
394	99.4555	39.0496	0	34
395	99.4565	39.0496	0	35
396	99.4578	39.0496	-54	-19
397	99.4591	39.0496	-27	9
398	99.4620	39.0494	-40	-3
399	99.4628	39.0495	-54	-16
400	99.4988	39.0447	46	20
401	99.4977	39.0448	78	53
402	99.4967	39.0448	-16	-39
403	99.4955	39.0448	23	1
404	99.4942	39.0450	46	25
405	99.4925	39.0449	39	19
406	99.4912	39.0449	46	27
407	99.4905	39.0449	326	309
408	99.4898	39.0447	31	15
409	99.4890	39.0448	23	8
410	99.4882	39.0449	54	40
411	99.4873	39.0451	31	18
412	99.4864	39.0451	31	19
413	99.4857	39.0451	62	52
414	99.4847	39.0451	31	22
415	99.4837	39.0447	31	23
416	99.4826	39.0441	31	24
420	99.4986	39.0472	58	28
421	99.4978	39.0471	58	29
422	99.4965	39.0472	46	19
423	99.4955	39.0472	0	-26
424	99.4944	39.0472	46	21
425	99.4932	39.0472	23	-1
426	99.4921	39.0472	81	58
427	99.4912	39.0474	0	-22
428	99.4905	39.0474	11	-10
429	99.4895	39.0474	0	-19
430	99.4888	39.0474	0	-18
431	99.4872	39.0474	34	17
432	99.4860	39.0475	0	-16
433	99.4849	39.0475	0	-15
434	99.4841	39.0475	34	20
435	99.4830	39.0475	0	-12
436	99.4816	39.0475	101	90
437	99.4805	39.0475	0	-10

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
438	99.4792	39.0475	0	-9
439	99.4783	39.0475	0	-8
440	99.4766	39.0547	48	19
441	99.4754	39.0546	91	63
442	99.4744	39.0546	8	-18
443	99.4731	39.0546	41	16
444	99.4720	39.0546	50	26
445	99.4709	39.0545	25	2
446	99.4697	39.0545	33	12
447	99.4684	39.0545	58	38
448	99.4672	39.0544	74	55
449	99.4654	39.0545	66	49
450	99.4643	39.0545	0	-16
451	99.4631	39.0545	45	30
452	99.4618	39.0545	180	166
453	99.4606	39.0542	-15	-27
454	99.4598	39.0546	75	64
455	99.4587	39.0546	15	5
456	99.4575	39.0545	15	6
457	99.4565	39.0545	47	40
458	99.4554	39.0547	14	8
459	99.4654	39.0444	14	34
460	99.4645	39.0444	22	43
461	99.4631	39.0443	14	36
462	99.4620	39.0444	14	37
463	99.4611	39.0443	0	24
464	99.4600	39.0443	7	31
465	99.4752	39.0442	7	32
466	99.4578	39.0443	14	40
467	99.4567	39.0444	44	71
468	99.4555	39.0444	22	50
469	99.4554	39.0451	22	51
470	99.4567	39.0452	14	43
471	99.4577	39.0452	72	102
472	99.4588	39.0452	22	53
473	99.4600	39.0452	28	60
474	99.4610	39.0451	36	69
475	99.4621	39.0451	29	63
476	99.4632	39.0452	29	64
477	99.4644	39.0453	14	49
478	99.4654	39.0454	22	58
480	99.4755	39.0478	78	53
481	99.4742	39.0478	66	42
482	99.4731	39.0479	36	13
483	99.4720	39.0479	48	27
484	99.4708	39.0479	60	40
485	99.4698	39.0479	36	17
486	99.4687	39.0479	42	24
487	99.4674	39.0479	30	14
488	99.4675	39.0487	30	15
489	99.4688	39.0487	36	22
490	99.4699	39.0486	36	23
491	99.4711	39.0487	30	19

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
492	99.4720	39.0488	6	-4
493	99.4731	39.0488	6	-3
494	99.4743	39.0487	-180	-188
495	99.4755	39.0487	72	66
496	99.4766	39.0487	24	19
497	99.4786	39.0571	-38	-22
498	99.4797	39.0571	31	48
499	99.4809	39.0571	6	23
500	99.4990	39.0439	68	42
501	99.4979	39.0440	-34	-58
502	99.4966	39.0441	34	11
503	99.4957	39.0442	84	63
504	99.4945	39.0441	60	40
505	99.4933	39.0441	0	-18
506	99.4923	39.0441	0	-17
507	99.4911	39.0441	34	19
519	99.4675	39.0443	32	48
520	99.4688	39.0443	16	32
521	99.4698	39.0443	24	41
522	99.4712	39.0444	48	66
523	99.4721	39.0443	32	51
524	99.4732	39.0443	16	35
525	99.4744	39.0443	16	36
526	99.4757	39.0443	-48	-27
527	99.4767	39.0442	-32	-10
528	99.4989	39.0459	0	-30
529	99.4978	39.0459	42	13
530	99.4966	39.0459	0	-27
531	99.4956	39.0459	21	-5
532	99.4947	39.0459	11	-14
533	99.4936	39.0459	0	-24
534	99.4924	39.0459	-21	-43
535	99.4914	39.0459	21	0
536	99.4900	39.0460	42	22
537	99.4890	39.0461	11	-8
538	99.4881	39.0461	11	-7
539	99.4870	39.0460	0	-16
540	99.4858	39.0460	21	6
541	99.4847	39.0459	32	18
542	99.4836	39.0459	21	8
543	99.4824	39.0459	21	10
544	99.4813	39.0459	42	32
545	99.4802	39.0460	11	2
546	99.4787	39.0459	11	3
547	99.4654	39.0521	26	39
548	99.4644	39.0521	18	32
549	99.4633	39.0522	0	15
550	99.4622	39.0521	35	51
551	99.4611	39.0522	10	27
552	99.4600	39.0522	0	18
553	99.4588	39.0522	0	19
554	99.4577	39.0522	0	20
555	99.4565	39.0521	0	21

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
556	99.4555	39.0521	58	80
557	99.4554	39.0514	20	43
558	99.4564	39.0513	0	24
559	99.4577	39.0513	58	83
560	99.4588	39.0513	88	114
561	99.4599	39.0513	0	27
562	99.4610	39.0513	0	28
563	99.4620	39.0512	0	29
564	99.4632	39.0512	0	30
565	99.4644	39.0513	-20	11
566	99.4654	39.0513	-20	12
567	99.4860	39.0442	45	90
568	99.4866	39.0442	-15	32
569	99.4871	39.0442	-45	4
570	99.4889	39.0441	15	65
571	99.4898	39.0442	15	67
572	99.4766	39.0537	7	-22
573	99.4755	39.0537	36	8
574	99.4744	39.0537	29	2
575	99.4732	39.0537	29	3
576	99.4721	39.0537	0	-25
577	99.4708	39.0538	44	20
578	99.4697	39.0538	42	19
579	99.4685	39.0537	-56	-78
580	99.4673	39.0538	28	7
581	99.4654	39.0539	-14	-34
582	99.4641	39.0538	0	-19
583	99.4632	39.0538	35	17
584	99.4633	39.0531	44	27
585	99.4619	39.0530	58	42
586	99.4619	39.0538	65	49
587	99.4606	39.0537	65	50
588	99.4607	39.0530	29	15
589	99.4596	39.0530	44	31
590	99.4597	39.0539	44	32
591	99.4586	39.0538	29	18
592	99.4586	39.0531	44	34
593	99.4575	39.0530	29	20
594	99.4576	39.0538	14	6
595	99.4564	39.0538	51	44
596	99.4565	39.0530	29	23
597	99.4676	39.0471	21	41
598	99.4688	39.0470	7	28
599	99.4698	39.0470	7	29
600	99.4660	39.0580	13	-1
601	99.4652	39.0581	20	7
602	99.4639	39.0581	6	-6
603	99.4628	39.0582	13	2
604	99.4615	39.0582	-13	-23
605	99.4599	39.0582	0	-9
606	99.4587	39.0582	0	-7
607	99.4577	39.0583	26	20
608	99.4569	39.0584	13	8

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
609	99.4555	39.0583	39	35
610	99.4999	39.0423	0	-30
611	99.4987	39.0424	39	10
612	99.4974	39.0426	65	37
613	99.4963	39.0427	26	-1
614	99.4953	39.0426	39	13
615	99.4942	39.0426	44	19
616	99.4930	39.0427	44	20
617	99.4921	39.0427	33	9
618	99.4912	39.0427	0	-23
619	99.4900	39.0428	38	16
620	99.4888	39.0427	11	-10
621	99.4875	39.0426	44	24
622	99.4864	39.0428	55	36
623	99.4854	39.0428	71	53
624	99.4843	39.0428	49	31
625	99.4833	39.0427	16	-1
626	99.4823	39.0426	11	-5
627	99.4812	39.0427	61	46
628	99.4803	39.0426	121	107
629	99.4791	39.0427	11	-2
630	99.4768	39.0390	0	-28
631	99.4757	39.0390	18	-9
632	99.4747	39.0390	24	-2
633	99.4736	39.0389	0	-25
634	99.4724	39.0390	12	-12
635	99.4711	39.0390	12	-11
636	99.4691	39.0390	12	-10
637	99.4679	39.0389	36	15
638	99.4657	39.0390	30	10
639	99.4644	39.0390	30	11
640	99.4629	39.0391	48	30
641	99.4616	39.0391	42	25
642	99.4606	39.0391	36	20
643	99.4594	39.0390	60	45
644	99.4587	39.0390	42	28
645	99.4576	39.0391	42	29
646	99.4566	39.0390	24	12
700	99.4594	39.0637	32	67
701	99.4605	39.0637	32	68
702	99.4615	39.0637	0	38
703	99.4626	39.0636	0	39
704	99.4638	39.0636	0	40
705	99.4649	39.0635	0	41
706	99.4556	39.0504	66	50
707	99.4567	39.0504	48	33
708	99.4578	39.0503	86	72
709	99.4590	39.0504	5	-8
710	99.4601	39.0503	38	27
711	99.4555	39.0483	40	51
712	99.4568	39.0483	35	47
713	99.4578	39.0482	70	83
714	99.4579	39.0475	15	29

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
715	99.4567	39.0475	25	40
716	99.4556	39.0476	15	31
717	99.4555	39.0442	0	16
718	99.4555	39.0434	-10	7
719	99.4555	39.0426	45	63
720	99.4556	39.0417	60	79
721	99.4556	39.0408	20	40
722	99.4556	39.0400	60	81
723	99.4557	39.0391	20	42
724	99.4557	39.0383	0	23
725	99.4557	39.0374	0	24
726	99.4556	39.0365	0	25
727	99.4558	39.0356	10	35
728	99.4569	39.0356	0	26
729	99.4578	39.0357	-10	17
730	99.4591	39.0356	0	28
731	99.4601	39.0356	0	29
732	99.4613	39.0356	10	40
733	99.4622	39.0356	10	41
734	99.4636	39.0356	20	52
735	99.4646	39.0356	5	38
736	99.4658	39.0355	40	74
737	99.4669	39.0355	20	54
738	99.4668	39.0363	40	75
739	99.4669	39.0373	50	86
740	99.4668	39.0382	70	107
741	99.4668	39.0391	120	158
742	99.4667	39.0399	60	99
743	99.4667	39.0408	79	54
744	99.4666	39.0416	147	123
745	99.4666	39.0425	94	70
746	99.4665	39.0434	162	139
747	99.4680	39.0356	25	3
748	99.4689	39.0355	50	29
749	99.4700	39.0355	50	29
750	99.4713	39.0356	19	-1
751	99.4724	39.0355	55	36
752	99.4736	39.0355	55	36
753	99.4747	39.0355	21	3
754	99.4757	39.0355	25	8
755	99.4767	39.0354	37	21
756	99.4781	39.0355	37	21
757	99.4781	39.0363	12	-3
758	99.4780	39.0372	-42	-56
759	99.4780	39.0380	10	-3
760	99.4780	39.0390	47	55
761	99.4780	39.0398	40	49
762	99.4779	39.0407	68	79
763	99.4779	39.0416	54	66
764	99.4779	39.0424	27	40
765	99.4780	39.0434	27	42
766	99.4790	39.0450	40	56
767	99.4801	39.0450	40	57

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
768	99.4824	39.0450	54	73
769	99.4812	39.0450	47	67
770	99.4999	39.0432	7	29
771	99.4999	39.0413	34	57
772	99.5000	39.0406	27	51
800	99.4640	39.0495	-40	-2
801	99.4652	39.0495	0	39
802	99.4789	39.0547	8	-19
803	99.4800	39.0546	64	38
804	99.4811	39.0547	40	16
805	99.4821	39.0547	72	49
806	99.4834	39.0547	68	46
807	99.4843	39.0548	15	-6
808	99.4854	39.0547	88	69
809	99.4866	39.0548	44	26
810	99.4876	39.0547	44	27
811	99.4886	39.0546	52	37
812	99.4898	39.0546	52	38
813	99.4908	39.0545	44	31
814	99.4920	39.0545	0	-11
815	99.4931	39.0545	18	8
816	99.4942	39.0545	46	37
817	99.4954	39.0546	0	-8
818	99.4965	39.0546	9	3
819	99.4976	39.0546	18	13
820	99.4985	39.0545	18	14
821	99.4996	39.0544	18	16
822	99.4766	39.0520	-26	-8
823	99.4756	39.0519	0	19
824	99.4745	39.0519	52	71
825	99.4731	39.0520	-13	7
826	99.4721	39.0520	26	47
827	99.4710	39.0521	-6	16
828	99.4702	39.0521	0	23
829	99.4690	39.0522	39	63
830	99.4678	39.0522	-26	-2
831	99.4677	39.0511	0	25
832	99.4691	39.0510	13	39
833	99.4702	39.0511	-13	14
834	99.4711	39.0511	0	28
835	99.4721	39.0510	-6	22
836	99.4733	39.0511	0	29
837	99.4742	39.0511	13	43
838	99.4754	39.0511	-26	5
839	99.4766	39.0511	0	32
840	99.4553	39.0591	34	8
841	99.4564	39.0591	24	-1
842	99.4574	39.0589	161	137
843	99.4587	39.0590	80	57
844	99.4599	39.0590	52	30
846	99.4620	39.0590	52	31
847	99.4632	39.0591	17	-3
848	99.4643	39.0590	6	-14

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
849	99.4653	39.0590	58	39
850	99.4662	39.0590	40	22
851	99.4662	39.0598	12	-5
852	99.4651	39.0599	58	42
853	99.4640	39.0598	34	19
854	99.4630	39.0599	44	30
855	99.4619	39.0598	38	25
856	99.4608	39.0599	0	-13
857	99.4596	39.0599	50	38
858	99.4586	39.0599	62	51
859	99.4576	39.0599	56	46
860	99.4562	39.0598	12	3
861	99.4552	39.0599	38	30
862	99.4988	39.0433	33	5
863	99.4976	39.0433	88	61
864	99.4964	39.0433	82	56
865	99.4953	39.0432	99	74
866	99.4941	39.0433	44	19
867	99.4932	39.0433	60	36
868	99.4923	39.0432	38	15
869	99.4913	39.0433	44	22
870	99.4900	39.0433	27	6
871	99.4887	39.0433	49	29
872	99.4877	39.0434	66	47
873	99.4865	39.0434	60	42
874	99.4854	39.0433	71	53
875	99.4844	39.0433	44	27
876	99.4833	39.0433	71	55
877	99.4821	39.0435	176	161
878	99.4809	39.0435	49	35
879	99.4798	39.0436	82	69
880	99.4786	39.0434	27	15
881	99.4768	39.0381	33	5
882	99.4757	39.0381	44	17
883	99.4743	39.0380	38	12
884	99.4730	39.0381	11	-14
885	99.4722	39.0381	0	-25
886	99.4712	39.0381	22	-2
887	99.4702	39.0381	44	21
888	99.4690	39.0381	27	5
889	99.4679	39.0381	71	50
890	99.4657	39.0381	66	46
891	99.4643	39.0381	33	14
892	99.4633	39.0381	88	70
893	99.4623	39.0381	44	26
894	99.4612	39.0381	55	38
895	99.4601	39.0382	71	55
896	99.4588	39.0381	66	51
897	99.4579	39.0381	44	30
898	99.4567	39.0382	58	45
900	99.4820	39.0571	12	28
901	99.4832	39.0571	0	17
902	99.4844	39.0570	6	24

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
903	99.4854	39.0571	0	19
904	99.4866	39.0571	0	20
905	99.4876	39.0570	0	21
906	99.4885	39.0571	0	23
907	99.4897	39.0571	0	24
908	99.4906	39.0571	25	50
909	99.4919	39.0571	6	32
910	99.4930	39.0570	0	27
911	99.4941	39.0571	0	28
912	99.4953	39.0571	-12	17
913	99.4964	39.0571	0	30
914	99.4974	39.0570	0	31
915	99.4987	39.0570	50	82
916	99.4996	39.0571	0	33
917	99.4553	39.0565	0	-28
918	99.4564	39.0565	0	-27
919	99.4575	39.0565	0	-26
920	99.4588	39.0565	0	-25
921	99.4598	39.0564	0	-24
922	99.4608	39.0565	20	-3
923	99.4624	39.0565	6	-16
924	99.4632	39.0565	-20	-42
925	99.4642	39.0564	0	-21
926	99.4653	39.0564	0	-20
927	99.4663	39.0564	6	-13
928	99.4675	39.0564	0	-18
929	99.4687	39.0564	0	-17
930	99.4697	39.0563	-6	-22
931	99.4709	39.0564	13	-2
932	99.4718	39.0564	13	-1
933	99.4733	39.0564	0	-13
934	99.4744	39.0564	-13	-25
935	99.4755	39.0564	0	-11
936	99.4766	39.0565	0	-11
937	99.4786	39.0581	-8	12
938	99.4797	39.0581	16	37
939	99.4808	39.0581	16	38
940	99.4819	39.0581	32	55
941	99.4833	39.0580	32	56
942	99.4844	39.0580	32	57
943	99.4854	39.0580	32	58
944	99.4867	39.0581	40	67
945	99.4876	39.0581	48	77
946	99.4885	39.0581	56	86
947	99.4885	39.0589	0	31
948	99.4877	39.0589	32	64
949	99.4865	39.0589	26	59
950	99.4854	39.0590	0	34
951	99.4844	39.0590	32	67
952	99.4832	39.0589	0	36
953	99.4819	39.0589	0	37
954	99.4808	39.0590	-65	-26
955	99.4795	39.0590	26	66

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
956	99.4785	39.0590	26	67
957	99.4989	39.0414	5	-26
958	99.4977	39.0414	19	-11
959	99.4966	39.0414	76	47
960	99.4955	39.0414	76	48
961	99.4944	39.0414	14	-13
962	99.4933	39.0415	48	22
963	99.4925	39.0414	86	61
964	99.4913	39.0415	81	57
965	99.4900	39.0415	62	39
966	99.4889	39.0415	57	35
967	99.4877	39.0416	38	16
968	99.4865	39.0415	48	27
969	99.4855	39.0416	48	28
970	99.4844	39.0416	43	24
971	99.4833	39.0416	76	58
972	99.4822	39.0416	48	31
973	99.4812	39.0416	65	49
974	99.4801	39.0416	65	50
975	99.4790	39.0416	60	46
976	99.4770	39.0434	20	31
977	99.4758	39.0434	-20	-9
978	99.4746	39.0433	10	22
979	99.4734	39.0434	45	58
980	99.4724	39.0434	10	24
981	99.4711	39.0433	0	15
982	99.4699	39.0435	15	31
983	99.4689	39.0434	-10	6
984	99.4677	39.0434	30	47
985	99.4656	39.0435	70	88
986	99.4644	39.0434	21	40
987	99.4632	39.0434	126	146
988	99.4621	39.0434	25	46
989	99.4611	39.0434	25	46
990	99.4602	39.0435	-20	1
991	99.4590	39.0434	20	42
992	99.4579	39.0434	35	58
993	99.4567	39.0434	5	28
994	99.4568	39.0426	20	44
995	99.4579	39.0425	35	59
996	99.4588	39.0425	35	60
997	99.4601	39.0425	30	56
998	99.4611	39.0425	50	76
999	99.4623	39.0426	20	47
1400	99.4632	39.0425	-55	-22
1401	99.4645	39.0425	-40	-5
1402	99.4657	39.0425	25	61
1403	99.4770	39.0398	24	-4
1404	99.4759	39.0399	30	3
1405	99.4748	39.0399	-12	-38
1406	99.4737	39.0399	12	-13
1407	99.4724	39.0399	-42	-66
1408	99.4714	39.0399	0	-23

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
1409	99.4701	39.0399	0	-22
1410	99.4691	39.0399	0	-21
1411	99.4680	39.0399	24	4
1412	99.4655	39.0399	360	341
1413	99.4646	39.0400	-120	-139
1414	99.4632	39.0399	72	54
1415	99.4622	39.0399	12	-5
1416	99.4612	39.0399	-95	-111
1417	99.4601	39.0399	66	51
1418	99.4589	39.0401	12	-2
1419	99.4578	39.0400	54	41
1420	99.4566	39.0400	12	0
1421	99.4768	39.0363	102	106
1422	99.4757	39.0364	24	29
1423	99.4745	39.0364	0	6
1424	99.4735	39.0364	18	25
1425	99.4724	39.0364	0	8
1426	99.4712	39.0364	0	8
1427	99.4700	39.0364	98	107
1428	99.4688	39.0364	65	75
1429	99.4678	39.0364	78	89
1430	99.4658	39.0364	156	168
1431	99.4646	39.0364	104	117
1432	99.4636	39.0365	65	79
1433	99.4624	39.0365	104	118
1434	99.4614	39.0365	72	87
1435	99.4601	39.0365	104	120
1436	99.4591	39.0364	91	108
1437	99.4580	39.0365	78	96
1438	99.4568	39.0365	52	71
1500	99.4913	39.0406	38	13
1501	99.4900	39.0406	-19	-43
1502	99.4889	39.0406	44	21
1503	99.4877	39.0406	50	28
1504	99.4866	39.0406	50	29
1505	99.4855	39.0407	56	36
1506	99.4846	39.0407	44	25
1507	99.4834	39.0407	44	26
1508	99.4823	39.0406	44	27
1509	99.4812	39.0406	31	15
1510	99.4801	39.0406	38	24
1512	99.4566	39.0416	32	42
1513	99.4577	39.0416	37	48
1514	99.4589	39.0417	47	59
1515	99.4601	39.0417	37	50
1516	99.4612	39.0417	21	35
1517	99.4622	39.0417	42	57
1518	99.4633	39.0416	32	48
1519	99.4645	39.0416	74	91
1520	99.4656	39.0417	0	18
1521	99.4676	39.0416	37	56
1522	99.4689	39.0416	11	31
1523	99.4699	39.0416	-11	10

Table 1: Helium concentrations in soil-gas corrected for temporal variation, Wakeeney, Trego Co., Kansas

Sample number	Longitude (X)	Latitude (Y)	Uncorrected helium (ppb)	Corrected helium (ppb)
1524	99.4712	39.0416	0	22
1525	99.4724	39.0416	0	23
1526	99.4734	39.0416	-11	13
1527	99.4746	39.0416	0	25
1528	99.4758	39.0416	22	48
1529	99.4769	39.0416	12	39
1530	99.4770	39.0424	0	28
1531	99.4757	39.0424	23	52
1532	99.4746	39.0424	23	53
1533	99.4733	39.0424	23	54
1534	99.4723	39.0424	-52	-20
1535	99.4711	39.0424	12	45
1536	99.4699	39.0424	6	40
1537	99.4688	39.0424	0	35
1538	99.4677	39.0424	-23	13
1539	99.4770	39.0407	37	9
1540	99.4759	39.0407	47	20
1541	99.4747	39.0407	21	-5
1542	99.4736	39.0407	16	-9
1543	99.4724	39.0407	32	8
1544	99.4712	39.0407	42	19
1545	99.4701	39.0407	32	10
1546	99.4689	39.0408	32	11
1547	99.4678	39.0408	34	14
1548	99.4656	39.0408	23	4
1549	99.4646	39.0408	29	10
1550	99.4634	39.0408	46	28
1551	99.4622	39.0408	46	29
1552	99.4612	39.0408	44	28
1553	99.4601	39.0409	44	29
1554	99.4589	39.0408	50	36
1555	99.4579	39.0409	56	43
1556	99.4567	39.0408	50	38
1557	99.4768	39.0372	72	76
1558	99.4757	39.0372	0	5
1559	99.4745	39.0373	24	30
1560	99.4731	39.0373	18	25
1561	99.4721	39.0373	12	20
1562	99.4714	39.0373	24	32
1563	99.4704	39.0373	24	33
1564	99.4692	39.0373	-96	-86
1565	99.4680	39.0373	30	41
1566	99.4659	39.0373	30	42
1567	99.4648	39.0373	24	37
1568	99.4636	39.0373	18	32
1569	99.4624	39.0373	12	26
1570	99.4613	39.0373	12	27
1571	99.4602	39.0374	0	16
1572	99.4593	39.0374	0	17
1573	99.4583	39.0373	54	72
1574	99.4569	39.0374	18	37